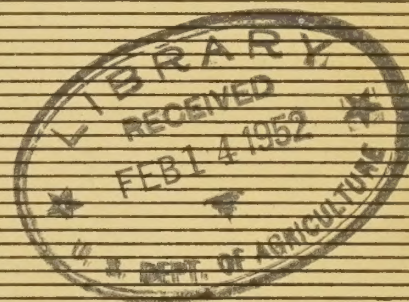


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**LARGE POWER RATES
AND CONTRACTS**



RURAL ELECTRIFICATION ADMINISTRATION

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GUIDES FOR HANDLING SERVICE CONTRACTS
AND RATES FOR LARGE POWER CONSUMERS

FOREWORD

General

S10192

This material has been prepared by the Retail Rate Section, Management Division, for the information and assistance of REA borrowers in serving large power consumers and in handling large power contracts. It supplements the information procedures and instructions contained in Management Memorandum 2, Rates and Contracts for Power Consumers, Engineering Memorandum 113R4, Large Power Applications and Administrative Bulletin No. 34-R2, Recommended Charges to Consumers for Special Line Extensions and Large Power Service Installations.

Additional information and recommendations on retail rates are contained in the Retail Rate Handbook and Administrative Bulletin No. 35, Retail Rates.

Definition

Large power consumers are defined as those requiring 25 KVA or more of transformer capacity.

Small Consumers

The material herein applies also to smaller consumers. However, minimum charges for consumers requiring less than 25 KVA of transformer capacity should be determined as recommended in Management Memorandum 2.

TVA, BPA and Other Rates

All systems whose power is supplied by the Tennessee Valley Authority use TVA resale rates. All rates of systems supplied by the Bonneville Power Administration are recommended jointly by REA and Bonneville and differ in some respects from typical REA rates. Therefore portions of this booklet do not apply to such systems.

The same comment applies to a number of other REA borrowers whose rates do not conform to the usual REA pattern. The extent to which the material in this booklet applies to rates of any particular system will generally be readily apparent.

Irrigation Service

For irrigation pumping REA Form MA-162, Agreement for Electric Service to Irrigation Pump, should be used.

Some REA-financed distribution systems have been designed to serve irrigation pumps in specified areas on an area coverage basis. In such cases, the minimum charges in the REA recommended irrigation rate schedule should be applied without regard to the length of the line extension.

GUIDES FOR HANDLING SERVICE CONTRACTS AND
RATES FOR LARGE POWER CONSUMERS

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UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Electrification Administration
Management Division
1951

GUIDES FOR HANDLING SERVICE CONTRACTS
AND RATES FOR LARGE POWER CONSUMERS

(A) Applicable Rates

1. Schedule B: (Sample schedule attached)

Nearly all REA systems have adopted in some form a Schedule B for Commercial and Power Service. If the schedule, as adopted, contains a demand charge per KW of maximum demand it is suitable for large power loads, but otherwise not. Where Schedule B contains only energy charges per KWH, its use should be limited to loads requiring not over 25 KVA of transformer capacity. A statement to this effect generally appears in the schedule.

2. Schedule LP: (Sample schedule attached)

Many REA systems have adopted a Schedule LP, Large Power Service, containing a demand charge, plus energy charges, consisting of blocks of KWH per KW of demand. This type of rate is recommended by REA for large consumers because it approximates the cost of furnishing service more closely than any other type of rate and because it gives the lowest possible rate to a consumer with a high load factor.

3. If no rate schedule has been adopted which is applicable to large power consumers, a Large Power Application form should be filled out for the consumer in question and forwarded to REA with a request for a recommended rate for large power service. The Management Division will then design a suitable rate for that consumer and for future application to other large consumers.

4. Choice Between Schedule B and Schedule LP:

If an REA system has adopted both a Schedule LP and a Schedule B applicable to large power, the consumer should be given his choice. It will usually be to his advantage to choose Schedule LP, particularly if his monthly load factor is high, because LP is designed to encourage high load factor and contains low priced blocks based on load factor. However, it will be to the small consumer's advantage to choose Schedule B because the minimum monthly charge in Schedule LP is never less than \$25.00.

5. Special Rates

A low special rate to an individual consumer should generally be avoided since other consumers will later demand the low rate.

On the other hand, the rates adopted for general use are sometimes inadequate to cover the cost of service where an unusually large new investment is needed to extend service. Also, the adopted rates may not be adequate or suitable if service is used very intermittently. For example, flood lighting for an athletic field usually requires a special rate and plants which operate only a few months per year, like cotton gins, usually require special treatment.

If the circumstances appear to require a special rate, REA Management Division should be consulted and a large power application submitted to the Engineering Division.

6. Summary

All REA systems should adopt a Schedule B for commercial and industrial lighting and power service. This schedule should contain a demand charge and it will then be suitable for serving large power consumers, as well as small commercial consumers.

In addition, many REA systems which have prospective or existing large power consumers will find it desirable to adopt a Schedule LP for service to large power consumers, particularly those having a high load factor. Schedule LP will result in a lower rate for high load factor. The consumer should have his choice between LP and B.

Special rates should usually be avoided but are sometimes necessary.

(B) Contracts for Power Service

1. General

The REA standard Agreement for Purchase of Power, Form CO-20, should be used. A copy is attached, including an alternate page 3 which contains provision for a deposit.

In case more than 140 KVA of transformer capacity is needed, the approval of the Administrator is required and the following sentence should be added to the end of Section 6, entitled "Succession." "This agreement shall not be binding upon the parties until approved by the Administrator of the Rural Electrification Administration."

Most corporations authorize only the President or Vice-President to execute contracts. Therefore, if incorporated, the consumer's president or vice-president must sign. Otherwise the contract is not binding. The signature should then be attested by consumer's Secretary. In the case of a partnership, a partner's signature is required.

2. Term

A five year term is generally recommended. While a longer term is desirable from the cooperative's viewpoint, the consumer is usually reluctant to obligate himself for a longer term. However, if the cooperative must make an unusually large investment to extend service, it is advisable to request a ten-year contract.

If the required new investment is small, a term shorter than five years is permissible. In general, the term should be long enough to enable the cooperative to avoid a loss if service is discontinued at the end of the initial term.

The attached table of required minimum bills is based on five-year contracts. Larger minimum bills would be required on shorter term contracts. Minimum bills could be reduced slightly on ten-year contracts.

3. Deposits

In some cases, a deposit advanced by the consumer is advisable in order to reduce the risk to the cooperative of furnishing service at a loss because of the expenditure to extend service.

A deposit is advisable if the prospective consumer is not a good credit risk.

A deposit may also be advisable on any short term contract.

Sometimes, a deposit is advisable on a five-year contract because of large investment for extending service.

The amount of the deposit should usually be the estimated new investment to extend service, less salvage value at the end of the contract term.

It is customary to return the deposit at the rate of ten percent of the monthly bills for service. Sometimes fifteen or twenty percent is used if this will not result in service below cost.

4. Termination Charges

It is sometimes permissible to add to the service contract a provision permitting the consumer to terminate service prior to the expiration of the initial contract term upon payment of a termination charge. When there is a termination charge, it is generally used instead of a deposit. The purpose in either case is to protect the seller against loss where a large investment is made by the seller to extend service to the consumer.

A deposit or a connection charge paid in advance by the consumer affords much better protection than a termination charge. The latter should only be used in the case of a consumer of exceptional financial strength and if there is little doubt that the connection charge can be collected without difficulty in case service is terminated.

The following example illustrates the use of the termination charge.

1. Assume that the new investment required to extend service is \$9,000 and the salvage value of the new facilities is \$4,000 during the first year. Therefore the nonrecoverable investment is \$5,000.
2. Assume that the consumer is unwilling to obligate himself to take service for more than one year, but that five years' revenue is required to avoid a loss to the seller.

Section 5 of the standard contract which is entitled, "Term" might then be modified by adding to the end of Section 5, the words,

"Provided, however, that Consumer may terminate this agreement prior to the expiration of the initial five-year period of service upon payment to Seller of a termination charge of \$5,000 less \$1,000 for each full year of service under this agreement".

5. Contract Capacity

The maximum capacity which the Seller is obligated to furnish is indicated in the opening paragraph of the contract by the words "up to _____ KVA". It is usually best to specify here the KVA of transformer capacity which will be installed and this then becomes the contract capacity.

6. Service Voltage

Enter under section 1 of the contract the voltage or voltages to be supplied by the Seller to the Consumer. If Seller is to furnish the transformers enter the secondary voltage (i.e. the voltage on the load side of the transformers) but if consumer is to furnish the transformers enter the primary (line) voltage.

Service may or may not be metered at the service voltage. When service is delivered at secondary voltage it should be metered at secondary voltage. When service is delivered at primary voltage it is generally best to meter at secondary voltage because low voltage metering equipment is much less expensive and is better protected from lightning and other

voltage disturbances. Provision is made in both Schedules B and LP for service at primary voltage with metering at secondary voltages.

DETERMINATION OF ADEQUATE MINIMUM CHARGE
FOR A LARGE POWER CONSUMER

Minimum Charge in Rate Schedule

Every rate schedule contains a minimum charge provision. Most of the rate schedules for power service recommended by REA contain a minimum monthly charge based on \$.75 per KVA of the transformer capacity required to serve the consumer. This minimum charge is adequate where no new investment is needed by the cooperative other than a transformer bank, service drop and meter. No consumer should be offered a minimum charge smaller than that called for in the schedule. A larger minimum charge may be needed if the cooperative must extend its lines, or rebuild its existing lines. As explained below, a table has been prepared which indicates the recommended minimum monthly charge where new investment is required to extend lines, convert lines from single to multiphase or increase system capacity. The required minimum charge should be inserted in section 2.a. of the contract.

General Requirements

It is generally considered desirable that the minimum monthly charge shall be large enough to cover the direct expenses incident to the new investment made to extend service to the consumer, plus the cost of the power which the consumer is entitled to use under the minimum bill. It is not generally advisable to make the minimum bill large enough to cover indirect expenses, such as expense incident to an allocated share of system investment of general operating and overhead expense. The direct annual expenses incident to the new investment generally amount to about twenty percent of the new investment and consist of operation, maintenance, interest, taxes and amortization of that portion of the new investment in excess of its salvage value. Amortization should usually be over a period of five to ten years. It is advisable to amortize the nonrecoverable investment over the term of the service contract unless there is fairly definite assurance that service will be continued beyond the contract term.

As stated above, in most REA recommended schedules the minimum monthly charge is based on \$.75 per KVA of required transformer capacity. This is usually sufficient to cover the cost of power included in the minimum bill, plus a new investment of between \$30.00 and \$40.00 per KW of the consumer's demand. If the new investment exceeds this amount, a larger minimum bill is needed.

Table for Determining Required Minimum Monthly Charge

The attached table is based on the foregoing consideration and shows the recommended minimum monthly bill per KW of maximum demand of the consumer. The table covers investments up to \$75.00 per KW demand.

If the investment exceeds \$75.00 per KW of consumer's maximum demand the adopted rate may be inadequate and a "Service Charge" should then be added to the rate as explained on page 8, or a rate recommendation may be obtained from REA.

The table is based on a five-year term of contract for service.

System power cost as used in the table is the average cost of power at the wholesale meter through which energy is supplied to the distribution system.

The following example illustrates the use of the table.

Example

Assume that:

New Investment to extend service is	\$4,000
Estimated maximum demand of consumer is	80 KW
Investment per KW is therefore	\$50.00
Wholesale power cost is	1.0¢/KWH
Then from the Table (line 4, column 4)	
Required Minimum Bill per KW is	\$1.06
Required Minimum monthly Bill is (\$1.06 x 80 KW) . .	\$84.80

Minimum Annual Charge

Consumers object to minimum charges during months when they make no use of service. Therefore, it is sometimes advisable to substitute an annual minimum charge in place of a monthly minimum if consumer's operations are seasonal to the extent that service is not used during several months of each year. Schedules B and LP contain provision for an annual minimum of 12 times the monthly minimum for seasonal service not exceeding 9 months per year. However, caution should be used in applying this provision on account of the large quantity of energy included for the minimum charge. In some cases this provision may be too liberal and an annual guarantee of more than 12 times the monthly minimum may be needed.

Determination of Minimum Bill for Large Power Load

The Figures in the Body of the Table are the Required Amount of Minimum Monthly Charge per KW of Consumer's Estimated Maximum Demand

New Investment per KW of'							
Consumer's Estimated	\$20	\$30	\$40	\$50	\$60	\$70	\$75
Maximum Demand							
See Note (2)							

System Average (3)

Power Cost, ¢/KWH:

.49 or less	'Note(1)	'Note(1)	'Note(1)	'\$.90'	'\$1.08'	'\$1.25'	\$1.35
.5 - .69	"	"	"	.93	1.12	1.30	1.40
.7 - .89	"	"	"	1.00	1.20	1.39	1.50
.9 - 1.09	"	"	.85	1.06	1.28	1.48	1.60
1.1 - 1.29	"	"	.90	1.12	1.35	1.58	1.70
1.3 - 1.49	"	"	.95	1.19	1.43	1.67	1.79
1.5 - 1.69	"	"	1.00	1.25	1.51	1.76	1.88
1.7 - 1.89	"	"	1.06	1.32	1.59	1.85	1.98
1.9 - 2.09	"	.84	1.11	1.38	1.67	1.94	2.08

Note (1) Use minimum monthly charge of 75 cents per KVA of required transformer capacity in accordance with the rate schedule minimum charge provision.

Note (2) New investment in facilities for sole use of the consumer which supplier must install to supply service.

Note (3) Average cost per KWH at the wholesale meter.

MAXIMUM EXPENDITURE TO EXTEND SERVICE WHICH REA
RECOMMENDED RATES WILL SUPPORT

Large Power Rates recommended by REA since 1947 have been designed to support a new investment by the cooperative not in excess of \$75.00 per KW of the consumer's maximum demand. In addition, they have been designed to support \$45.00 per KW as an allocated share of existing system investment in distribution facilities. The allocated share of system investment is based on the rough assumption that a typical consumer is located ten miles from the system's power source and that \$45.00 per KW at present prices represents consumer's share of investment in 10 miles of three phase line and the substation at the power source.

Rates recommended prior to 1947 allowed for only \$50.00 per KW of new investment and \$30.00 per KW share of system investment based on lower prevailing price levels. Therefore, if the investment exceeds the foregoing limits, the adopted rate may not be adequate to cover the cost of service. In such cases, a Service Charge should be added as recommended in the paragraph below, or a large Power Application should be submitted to REA with a request for a recommended rate and contract.

Service Charges

In case the investment required to furnish service exceeds the limits used by REA in the rate design as described in the preceding paragraph, more revenue will be needed. This can be obtained by adding a service charge to each monthly power bill as a separate item in addition to the charges under the rate schedule. The recommended amount of the charge is 1.5% of the amount by which the expenditure required to extend service exceeds \$75.00 per KW of consumer's estimated maximum demand. This corresponds to 18% per year and is sufficient to amortize the excess expenditure (less salvage value) in less than ten years and cover operation, maintenance and interest on the excess investment.

Sometimes other methods of handling high investment per KW are better than a service charge and if a large power application is submitted to REA headquarters, rate and contract recommendations will be supplied on request.

If a service charge is added the contract for service (Form CO-20) should be modified as follows:

1. Add the following section to the contract after Section 6.

7. Service Charge

To the amount of each monthly bill for service hereunder as computed in accordance with the rate schedule attached hereto, there shall be added a service charge of \$_____. This service charge is included in the minimum charge specified in Section 2 of this agreement.

2. In Section 2 the amount of the minimum charge to be inserted should be the minimum charge determined as described on pages 5 to 7 plus the service charge.

SERVICE AT PRIMARY LINE VOLTAGE

If the consumer agrees to take service at primary line voltage, thus saving the cooperative the first cost and maintenance expense on consumer's transformer substation he is entitled to a lower rate. REA generally recommends a ten percent discount from the applicable rate. Service is then delivered on the primary side of consumer's substation and since the consumer purchases energy at this point he pays for transformer losses.

Although electric service is normally metered at the delivery point, it is preferable in the case of primary service to meter on the secondary side of the transformers. The amount of transformer loss in KWH and KW is then estimated and added to the registrations of the watt-hour meter and demand meter. This not only saves the high cost of primary voltage metering equipment, but also saves damage to metering equipment due to lightning and other voltage disturbances on the primary lines. Estimated transformer losses are based on the transformer manufacturer's specifications.

Provision for service at primary voltage and for metering at either primary or secondary voltage is contained in the standard REA Schedules B and LP.

ANALYSIS OF THE COST OF SERVING A LARGE POWER CONSUMER

The cost to a cooperative of furnishing service to a large power consumer consists of two main items:

1. Cost to the cooperative of purchasing (or generating) the power used by the consumer.
2. Expense incident to the cooperative's investment in facilities devoted to serving the large power consumer.

Power Cost

Since nearly all wholesale rates on which cooperatives purchase power have demand charges and are thus based on load factor, the cost per KWH to the cooperative of the power used by a large power consumer is in general different from the system average cost of power per KWH. If the large power consumer has a load factor higher than the system load factor, the power cost will be less, but if the power consumer has a low load factor, the power cost will be greater than the system average unless the consumer's load is "off-peak". Thus power cost depends on how much the system maximum demand at the wholesale meter is increased by reason of serving the large power consumer.

Therefore in analyzing power cost, the wholesale rate must be broken down into demand cost per KW and energy cost per KWH. The resulting costs will be referred to hereafter as the "Equivalent Wholesale Rate".

Many wholesale rates contain charges per KWH which are stated in terms of "hours use of the maximum demand" or "KWH per KW of maximum demand". Such charges contain both demand and energy elements. It is possible to transform them into an equivalent wholesale rate consisting of a demand charge per KW plus an energy charge per KWH. In order to assist borrowers to analyze the cost of serving large power consumers REA rate engineers will, upon request to the Management Division, analyze the borrower's wholesale rate and forward a statement of the equivalent rate.

If the cooperative generates its power the same factors enter into the cost of service and the cost of generation should therefore be broken down into cost per KW of peak load and cost per KWH delivered.

In considering the extent to which the load of a given large power consumer will be on-peak or off-peak, it is wise to assume that daytime loads will in the future be on-peak loads, even though the system peak now occurs in the evening. There is a definite trend on most REA systems toward daytime system peaks and away from evening peaks. This is because daytime loads are increasing much more rapidly than evening lighting loads.

Unless there is definite information to the contrary, we suggest that the effect of the demand of large power consumers on the system peak be based on their estimated load factor and on the corresponding estimated diversity of demands in accordance with the attached table (page 15) which is currently being used by REA rate engineers.

Investment Expense

The investment by the cooperative to serve a typical large power consumer is in part new investment in facilities for the sole use of that consumer and in part investment in facilities for general use by that consumer and other consumers. All of the expense incident to the former is directly chargeable to the new consumer and an equitable portion of the expense incident to the latter should be allocated to the new consumer in proportion to consumers maximum demand.

When a new consumer is connected, there is normally spare capacity in the main substation and backbone distribution lines which has already been paid for, but this is no reason for not charging the new consumer for the capacity he uses. No consumer should be given a free ride on facilities paid for by others and capacity that is surplus today is generally not surplus tomorrow on a growing system.

The expenses incident to investment consist of operating expense, maintenance, replacement, general overhead expense, taxes, insurance and interest. Debt amortization must also be met and should be included in place of depreciation.

New investment for the exclusive use of a large power consumer (less salvage value) is usually amortized over a period of 5 to 10 years. It should be amortized over the term of the service contract unless there is reasonable assurance that service will continue longer.

General system investment should be amortized over the period of the REA loan.

All of the foregoing items of expense per year are generally expressed in terms of percent of the amount of investment.

Attached is a copy of Form CO-124R used by REA rate engineers to compute estimated revenue and expense of serving a large power consumer. In order to illustrate this method of estimating revenue and expense computations have been filled in for a typical consumer under assumed conditions. It is further assumed that the cooperative has adopted for general use the attached Schedules B and LP.

Allocated Share of System Investment**

It is usually difficult to determine accurately the amount of existing investment in distribution facilities which should be allocated to a prospective power consumer, but in designing power rates for general use, REA rate engineers allocate \$45.00 per KW of consumer's demand. In arriving at this figure the assumption is made that a typical rural power consumer is located 10 miles from the main substation and that typical line loading is 600 KW. With three phase line cost of \$2,000 per mile, investment per KW for ten miles of line is therefore \$33.00. The remaining \$12.00 per KW is for main substation investment.

Based on this allowance of \$45.00 investment per KW demand, an annual expense allowance of \$4.80 per KW is used or about 10.7% of investment. The 10.7% is made up of 3% for distribution operation, maintenance and replacement, plus 2% for other operating expenses, plus 1% for taxes, plus 4.7% for interest and amortization of debt.

Thus, an annual expense allowance of \$4.80 per KW of consumer's maximum demand is used to cover allocated share of system investment in analyzing the cost of serving a typical large power consumer. However, if the location of the consumer with respect to the source of power or some other circumstance indicates that a different figure should be used, the allowance is altered to suit the facts of the case.

** See Form CO-124R, entitled Large Power Rate Computations, last item under heading "Fixed Expenses".

LARGE POWER RATE COMPUTATIONS

SYSTEM DESIGNATION

CONSUMER

Atlantic Milling Co.

DATE 5-1-51

BY J. Doe

DEMAND 70 KW

KWH PER MONTH 15,000

KWH PER YEAR 180,000

SOURCE OF POWER:

United Power Company

WHOLESALE RATE	EQUIVALENT RATE	WHOLESALE RATE PROVISIONS
\$1.50 per KW	At consumer's meter including	FUEL ADJUSTMENT
0.6¢ per KWH	15% losses	POWER FACTOR ADJUSTMENT
	\$1.77 per KW	TAX ADJUSTMENT
	0.7¢ per KWH	DUAL RATE RESTRICTIONS

INVESTMENT

CONSTRUCTION COST	\$ 4,200	\$ 60 /KW
SALVAGE VALUE AFTER 10 YEARS	\$ 1,200	Alternative Computation
NON-RECOVERABLE INVESTMENT	\$ 3,000	No. 1
DEPOSIT	---	Use this computation if it
BALANCE TO BE AMORTIZED	\$ 3,000	is decided that investment

FIXED EXPENSES

AMORTIZE \$ 3,000 IN 10 YEARS	\$ 300
OPERATION AND MAINTENANCE \$ 4,200 @3%	\$ 126
INTEREST TAXES AND GENERAL \$ 4,200 @4%	\$ 168
SHARE OF SYSTEM INVESTMENT 70 KW @ \$4.80	\$ 336
SUB-TOTAL PER YEAR	\$ 930
SUB-TOTAL PER MONTH	\$ 77.50

Use this computation if it is decided that investment may be amortized over a ten year period and that no deposit is needed.

POWER COST (At Consumer's Meter)

DEMAND COST \$ 1.77 X 70 KW X .9 DIVERSITY	\$ 111
ENERGY COST .007 X 15,000 KWH	\$ 105
TOTAL MONTHLY POWER COST	\$ 216
TOTAL ANNUAL POWER COST	\$ 216.00
TOTAL EXPENSES: PER MONTH	\$ 293.50
PER YEAR	\$ 1.44¢/kwh

REVENUE (On Proposed Rate) Schedule IP

70 KW @ \$ 1.50	\$ 105.00
70 x 50 = 3,500 KWH @ 2.5	\$ 87.50
70 x 100 = 7,000 KWH @ 1.5	\$ 105.00
4,500 KWH @ 1.0	\$ 45.00
15,000 KWH @	\$ 342.50
REVENUE PER MONTH	\$ 2.28 ¢/KWH
REVENUE PER YEAR	\$ ¢/KWH
EXPENSES	\$ 293.50
MARGIN	\$ 49.00

MINIMUM BILL

Investment per KW \$60
 *System Power Cost (at whole-sale meter) 1.03¢/KWH
 Min. bill per KW \$1.28 (from min. bill table)
 Min. Bill \$1.28 x 70 KW = \$89.60
 Round off to = \$90.00

* This corresponds to the use of 350 KWH per KW of demand (or 48% load factor) on the above wholesale rate of United Power Co.

LARGE POWER RATE COMPUTATIONS

CONSUMER

Atlantic Milling Company

DATE May 1, 1951	BY J. Doe	DEMAND 70 KW	KWH PER MONTH 15,000	KWH PER YEAR
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SOURCE OF POWER.

United Power Company

WHOLESALE RATE	EQUIVALENT RATE	WHOLESALE RATE PROVISIONS
\$1.50 per KW 0.6¢ per KWH	At consumer's meter including 15% losses. \$1.77 per KW 0.7¢ per KWH	FUEL ADJUSTMENT POWER FACTOR ADJUSTMENT TAX ADJUSTMENT DUAL RATE RESTRICTIONS

INVESTMENT

CONSTRUCTION COST	\$ 4,200.00	\$ 60.00 /KW
SALVAGE VALUE AFTER 5 YEARS	\$ 1,500.00	Alternative Computation
NON-RECOVERABLE INVESTMENT	\$ 2,700.00	No.2
DEPOSIT	\$ 2,700.00	Use this computation if it is
BALANCE TO BE AMORTIZED	\$ -----	decided that the investment

FIXED EXPENSES

AMORTIZE \$ ----- IN ----- YEARS	\$ -----	make deposit of nonrecoverable
OPERATION AND MAINTENANCE \$ 4200.00 @3%	\$ 126.00	investment.
INTEREST TAXES AND GENERAL \$ 4200.00 @4% \$4.80	\$ 168.00	
SHARE OF SYSTEM INVESTMENT 70 KW @ \$5.10	\$ 336.00	
SUB-TOTAL PER YEAR	\$ -----	\$ 630.00
SUB-TOTAL PER MONTH	\$ -----	\$ 52.00

POWER COST (At Consumer's Meter)

DEMAND COST \$ 1.77 x 70 KW x .9 DIVERSITY \$111.00	
ENERGY COST .007 x 15,000 KWH	\$ 105.00
TOTAL MONTHLY POWER COST	\$ 216.00
TOTAL ANNUAL POWER COST	\$ -----
TOTAL EXPENSES: PER MONTH	\$ 268.00
PER YEAR	\$ -----

REVENUE (On Proposed Rate) Schedule LP

70 KW @ \$ 1.50	\$ 105.00
70 x 50 = 3500 KWH @ 2.5 ¢	\$ 87.50
70 x 100 = 7000 KWH @ 1.5 ¢	\$ 105.00
4500 KWH @ 1.0 ¢	\$ 45.00
15000 KWH @	\$ 342.50
REVENUE PER MONTH Less 10% (refund on deposit)	\$ 34.25
REVENUE PER YEAR	\$ 308.25
EXPENSES	\$ 268.00
MARGIN	\$ 40.25

MINIMUM BILL

Construction cost less deposit \$4,200 - 2,700 = \$1,500 or \$21.00 per KW. In view of investment by cooperative of only \$21.00 per KW a minimum monthly charge of 75¢ per KVA of transformer capacity as specified in rate schedule is adequate.

BILL ON SCHEDULE B

Usage

70 KW demand
15,000 kwh

Bill

40 KWH @ 8 ¢	\$ 3.20
40 KWH @ 5 ¢	2.00
920 KWH @ 3 ¢	27.60
2000 KWH @ 2 ¢	40.00
12000 KWH @ 1.75 ¢	210.00

Demand Charge

70 - 10 = 60 x 1.75

105.00

Bill

\$387.80

Minimum Bill - \$90.00

(Same as on Schedule LP)

Note:

Since the bill is \$387.80 on Schedule B as compared with \$342.50 on Schedule LP for the same usage it will pay this consumer to elect service on Schedule LP.

LOAD FACTOR

Definition:

Load factor is the ratio of the average load over a designated period to the peak load occurring in that period.

Example

- (a) Monthly load factor of a consumer:

Assume that consumer's peak load (demand) is 60 kw and that his monthly usage is 12000 KWH.

There are 730 hours in the average month.

Therefore the consumer's average load is

$$\frac{12000}{730} = 16.45 \text{ KW}$$

and consumer's monthly load factor is by definition

$$\frac{16.45}{60} = 27.4\%$$

- (b) Based on an average month of 730 hours, a consumer with 100% load factor would have a monthly KWH usage of 730 times his KW demand.
- (c) Many REA systems have a monthly load factor of about 50 percent. Their monthly KWH usage is about 365 times their KW demand.

DIVERSITY OF LARGE POWER CONSUMER DEMANDS **

Allowances suggested for estimating effect of power loads on system peak in connection with wholesale power cost.

(1)	(2)	(3)
KWH per KW demand	Load Factor	% of demand on system peak
50	6.8%	30
100	13.7%	50
150	20.5%	70
200	27.4%	85
300 or more	41.1% or more	100

Column (1) is consumer's monthly KWH usage per KW of consumer's maximum demand.

Column (2) is the monthly load factor corresponding to the KWH per KW in Column (1). The percent load factor times 730 equals the KWH per KW.

Column (3) is the estimated demand of consumer at the time of the maximum system demand for the month (in percent of consumer's maximum demand).

Example:

Consumer's maximum demand	50 KW
Consumer's monthly usage	10,000 KWH
KWH per KW	200
Percent of demand on peak	85

Thus consumer will add $50 \times .85 = 42.5$ KW to the system peak.

** See Form CO-124R, Large Power Rate Computations, under the heading "Power Cost".

EXAMPLE OF RATE AND CONTRACT DETERMINATION

1. Prospective Consumer Data:

Name	Atlantic Milling Company
Service Location	Fairmont, N. C.
Estimated demand	70 KW
Estimated usage per month	15,000 kwh
Type of service	120/240 volts, 3 phase

2. Supplier Data:

Transformer capacity	75 KVA
New construction cost	\$4,200
Average system power cost at wholesale meter	1.03 ¢/KWH
New investment per KW	$\frac{4200}{70} = \$60$

3. Recommendations

- (a) Since new investment per KW is less than \$75, Schedule B or Schedule LP should be adequate as adopted for general use.
- (b) Compute bill in each rate to determine which is more advantageous to the consumer.
Bill on Schedule B is \$387.80 (See Page 14)
Bill of Schedule LP \$342.50 (See Page 15)
Therefore offer Schedule LP.
- (c) Determination of minimum monthly charge to be inserted in contract based on minimum bill table on Page 8.

New investment per kw	\$60
System average power cost	1.03¢/KWH
Minimum bill per KW (from column 5, line 4 of table)	\$1.28
Required minimum bill	$\$1.28 \times 70 = \89.60
Round off to	\$90.00
- (d) A five-year contract term appears to be suitable for this consumer since the amount of new investment per KW is normal.
- (e) Assuming that the Atlantic Milling Company is a good credit risk and will continue to take service after the initial five-year term, there is no need for the consumer to put up a deposit in aid of construction.

The attached form of power contract has been filled out in accordance with the foregoing recommendations.

SCHEDULE B

COMMERCIAL AND INDUSTRIAL LIGHTING AND POWER SERVICE

Availability

Available for commercial, industrial and three-phase farm service for all uses including lighting, heating and power, subject to the established rules and regulations.

Type of Service

Single-phase, and three-phase at available secondary voltages. Motors having a rated capacity in excess of ten horsepower must be three-phase.

Rate

Energy Charge

First	40 kwh per month	@ 8.0 ¢ per kwh
Next	40 kwh per month	@ 5.0 ¢ per kwh
Next	920 kwh per month	@ 3.0 ¢ per kwh
Next	2000 kwh per month	@ 2.0 ¢ per kwh
Next	kwh per month	@ ¢ per kwh
Over	3000 kwh per month	@ 1.75 ¢ per kwh

Demand Charge

First 10 kilowatts of billing demand per month, no demand charge. Excess above 10 kilowatts of billing demand per month at \$1.75 per kilowatt.

Fuel Cost Adjustment Charge

In case the consumer's billing demand for the current month exceeds ten kilowatts the foregoing energy charge shall be adjusted, provided the rate under which Seller purchases power at wholesale is adjusted in accordance with a fuel cost adjustment provision in Seller's wholesale power contract. In such case foregoing energy charges shall be adjusted for the current month by the same amount per KWH as the fuel cost adjustment per kwh in Seller's wholesale power bill for the next preceding month.

Determination of Billing Demand

The billing demand shall be the maximum kilowatt demand established by the consumer for any period of fifteen consecutive minutes during the month for which the bill is rendered, as indicated or recorded by a demand meter and adjusted for power factor as follows:

SCHEDULE B (Continued)

Power Factor Adjustment

The consumer agrees to maintain unity power factor as nearly as practicable. Demand charges will be adjusted for consumers with 50 KW or more of measured demand to correct for average power factors lower than 90%, and may be so adjusted for other consumers if and when the Seller deems necessary. Such adjustments will be made by increasing the measured demand 1% for each 1% by which the average power factor is less than 90% lagging.

Minimum Monthly Charge

The minimum monthly charge under the above rate shall be \$ 2.50 where 3 KVA or less of transformer capacity is required. For consumers requiring more than 3 KVA of transformer capacity the minimum monthly charge shall be increased by 75¢ for each additional KVA or fraction thereof required. Where it is necessary to extend or re-enforce existing distribution facilities, the minimum monthly charge may be increased to assure adequate compensation for the added facilities. Where the minimum charge is increased in accordance with the terms of this section, additional energy and demand shall be included in accordance with the foregoing rate schedule.

Minimum Annual Charge for Seasonal Service

Consumers requiring service only during certain seasons not exceeding nine months per year may guarantee a minimum annual payment of twelve times the minimum monthly charge determined in accordance with the foregoing section, in which case there shall be no minimum monthly charge.

Temporary Service

Temporary service shall be supplied in accordance with the foregoing rate except that the consumer shall pay in addition to the foregoing charges the total cost of connecting and disconnecting service less the value of materials returned to stock. A deposit, in advance may be required of the full amount of the estimated bill for service, including the cost of connection and disconnection.

Service at Primary Voltage

If service is furnished at primary distribution voltage, a discount of ten percent (10%) shall apply to the demand and energy charges, and if the minimum charge is based on transformer capacity, a discount of 10% shall also apply to the minimum charge. However, service may be metered at secondary voltage and adjusted to primary metering by adding the estimated transformer losses to the metered kilowatt-hours and kilowatt demand.

Terms of Payment

The above rates are net, the gross rates being 10% higher on the first \$25.00 and 2% on the remainder of the bill. In the event the current monthly bill is not paid within fifteen (15) days from the date of the bill, the gross rates shall apply.

SCHEDULE LP
LARGE POWER SERVICE

Availability

Available to consumers located on or near Seller's three-phase lines for all types of usage, subject to the established rules and regulations of Seller.

Rate

\$ 1.50 per month per KW of billing demand:
Plus energy charges of -
2.5 ¢ per KWH for the first 50 KWH used per month
per KW of billing demand
1.5 ¢ per KWH for the next 100 KWH used per month
per KW of billing demand
1.0 ¢ per KWH for all remaining KWH used per month

Determination of Billing Demand

The billing demand shall be the maximum kilowatt demand established by the consumer for any period fifteen consecutive minutes during the month for which the bill is rendered, as indicated or recorded by a demand meter and adjusted for power factor as follows:

Power Factor Adjustment

The consumer agrees to maintain unity power factor as nearly as practicable. Demand charges will be adjusted for consumers with 50 KW or more of measured demand to correct for average power factors lower than 90%, and may be so adjusted for other consumers if and when the Seller deems necessary. Such adjustments will be made by increasing the measured demand 1% for each 1% by which the average power factor is less than 90% lagging.

Fuel Cost Adjustment Charge

In case the rate under which Seller purchases power at wholesale is adjusted in accordance with a fuel cost adjustment provision in Seller's wholesale power contract, the foregoing energy charges shall be adjusted each month by the same amount per KWH as the fuel cost adjustment per KWH in Seller's wholesale power bill for the next preceding month.

Minimum Monthly Charge

The minimum monthly charge shall be the highest one of the following charges as determined for the consumer in question.

- (1) The minimum monthly charge specified in the contract for service.

SCHEDULE LP (Continued)

Minimum Monthly Charge (Continued)

- (2) A charge of \$0.75 per KVA of installed transformer capacity.
- (3) A charge of \$25.00.

Minimum Annual Charge for Seasonal Service

Consumers requiring service only during certain seasons not exceeding nine months per year may guarantee a minimum annual payment of twelve times the minimum monthly charge determined in accordance with the foregoing section in which case there shall be no minimum monthly charge.

Type of Service

Three-phase, 60 cycles, at Seller's standard voltages.

Conditions of Service

1. Motors having a rated capacity in excess of ten horsepower (10 H.P) must be three-phase.

2. Both power and lighting shall be billed at the foregoing rate. If a separate meter is required for the lighting circuit, the registrations of the two watt-hour meters shall be added to obtain total kilowatt-hours used and the registrations of the two demand meters shall be added to obtain the total kilowatt demand for billing purposes.

3. All wiring, pole lines, and other electrical equipment beyond the metering point, shall be considered the distribution system of the consumer and shall be furnished and maintained by the consumer.

4. If service is furnished at primary distribution voltage, a discount of ten per cent (10%) shall apply to the demand and energy charges, and if the minimum charge is based on transformer capacity, a discount of 10% shall also apply to the minimum charge. However, the Seller shall have the option of metering at secondary voltage and adding the estimated transformer losses to the metered kilowatt-hours and kilowatt demand.

Terms of Payment

The above rates are net, the gross rates being 10% higher on the first \$25.00 and 2% on the remainder of the bill. In the event the current monthly bill is not paid within fifteen (15) days from the date of the bill, the gross rates shall apply.

AGREEMENT FOR PURCHASE OF POWER

AGREEMENT made _____, 19____, between _____

(hereinafter called
the "Seller"), and _____ Atlantic Milling Company
(hereinafter called the "Consumer"), a corporation, partnership, individual
(strike inapplicable designations).

WITNESSETH:

The Seller agrees to sell and to deliver to the Consumer, and
the Consumer agrees to purchase and receive from the Seller all of the
electric power and energy which the Consumer may need at its mill
at Fairmont, North Carolina up to 75 KVA, upon the
following terms:

1. Service Characteristics

Service hereunder shall be alternating current, three
phase, sixty cycles, 120/240 volts.

2. Payment

a. The Consumer shall pay the Seller for service hereunder
at the rates and upon the terms and conditions set forth in Schedule LP
attached to and made a part of this agreement. Notwithstanding any provision
of the Schedule, however, the minimum charge per month shall be \$ 90.00.

b. Bills for service hereunder shall be paid at the office
of the Seller in _____ State of _____ monthly within
fifteen days after the bill is mailed to the Consumer. If the Consumer
shall fail to pay any such bill within such fifteen day period, the Seller
may discontinue service hereunder by giving fifteen days' notice in writing
to the Consumer.

c. The Consumer agrees that if, at any time, the rate under which the Seller purchases electric energy at wholesale is modified, the Seller may make a corresponding modification in the rate for service hereunder. If the rate is increased thereby the Consumer shall then have the option of cancelling this agreement and discontinuing service.

3. Continuity of Service

The Seller shall use reasonable diligence to provide a constant and uninterrupted supply of electric power and energy; but if such supply shall fail or be interrupted, or become defective through act of God, or the public enemy, or by accident, strikes, labor troubles, or by action of the elements, or inability to secure rights-of-way, or other permits needed, or for any other cause beyond the reasonable control of the Seller, the Seller shall not be liable therefor.

4. Membership

The Consumer shall become a member of the Seller, shall pay the membership fee and be bound by the provisions of the articles of incorporation and bylaws of the Seller and by such rules and regulations as may from time to time be adopted by the Seller.

5. Term

This agreement shall become effective on the date service is first delivered hereunder by the Seller to the Consumer, and shall remain in effect for a period of 5 years and thereafter until terminated by either party giving to the other 3 months notice in writing.

6. Succession

This agreement shall be binding upon and inure to the benefit of the successors, legal representatives and assigns of the respective parties hereto.

IN WITNESS WHEREOF, the parties hereto have caused this agreement to be executed by their duly authorized representatives all as of the day and year first above written.

Seller

By _____
President

Attest:

Secretary

Atlantic Milling Company
Consumer

By _____

Title of Officer*

Attest:

Secretary

*If other than president, vice-president, partner or owner, a power of attorney must accompany contract.

7. Deposit

The Consumer shall deposit with the Seller the sum of \$ 2,700.00 on account of the cost of facilities required to make service available to the Consumer on or before the commencement of construction of such facilities. Such deposit shall be returnable to the Consumer in the form of a credit on each bill for service in the amount of 10 percent of the bill, which credits shall continue until they total \$ 2,700.00. No refund shall be made to the Consumer of any portion of the deposit remaining upon termination of this agreement.

IN WITNESS WHEREOF, the parties hereto have caused this agreement to be executed by their duly authorized representatives all as of the day and year first above written.

Attest:

Secretary

Seller

By _____
President

Consumer

By _____

Title of Officer*

Attest:

Secretary

*If other than president, vice-president, partner or owner, a power of attorney must accompany contract.

NEED FOR DEMAND CHARGES IN RATES FOR LARGE CONSUMERS

Virtually all electric rates for service to large consumers contain "demand" charges. As its name implies, the demand charge is a charge for the consumer's peak load or maximum requirements in kilowatts (not kilowatt-hours) during the month. It is the consumer's maximum demand which determines the size of the transformer and the capacity of the lines needed for his service. In fact, his demand determines the amount of investment which the supplier must make for him in its electric distribution system all the way from the consumer's meter back to the wholesale meter or the generating plant. Consequently, the cost to the electric supplier of furnishing service usually depends more on the consumer's demand than on his KWH usage. The only important expense item depending entirely on KWH used is fuel burned in the generating plant, or in the case of a system purchasing its energy at wholesale, the energy charge per KWH in the wholesale rate (as distinguished from the demand charge in the wholesale rate).

In spite of the importance of demand as a factor in the cost of service, it is customary to bill residential consumers and other comparatively small consumers entirely on the basis of KWH used. This comes about partly because some consumers object to a demand charge on the grounds that it is a charge for which they receive no energy. Although this objection is not justified, it has hindered the more general use of demand charges. By setting the price per KWH high enough it is possible to obtain sufficient revenue from residential or small commercial consumers to cover costs on an over-all basis. While this simple method of charging for electric service is fairly satisfactory for small consumers, it is important in the case of large consumers to approximate more closely the actual cost of serving the individual consumer and this can be done only by billing on the basis of both demand and KWH. This not only assures the supplier of revenue sufficient to cover costs but also gives the consumer the benefit of a low rate per KWH if he earns it by having KWH usage which is large in comparison with his demand. As a result desirable business is promoted by a low rate per KWH and high cost business is required to pay its way.

While it is true that other things being equal the cost per KWH of furnishing electric service declines as quantity used increases, nevertheless the cost of serving large consumers depends to a much greater extent on load factor (which is the ratio of KWH actually used, to KWH which would have been used by continuous operation at maximum demand). In other words, the familiar "block energy" rate with blocks at prices per KWH declining with quantity used, makes no direct provision for the most important factor in cost per KWH, namely, demand. In the case of consumers whose usage of energy is very small both demand and energy costs are small and the cost of service consists principally of expenses incident to the investment made to extend service to him and the cost of billing and collecting. Therefore as his KWH usage increases, the cost per KWH declines rapidly. On the other hand, when a large consumer increases his usage the cost per KWH of serving him declines much less rapidly and quantity used becomes of minor importance in comparison with load factor, in determining the over-all cost per KWH of furnishing service.

The consumer's demand is measured by a demand meter which indicates the maximum demand which has occurred since the meter was last read. Inexpensive demand meters are available which are suitable for all but very large consumers. For comparatively small consumers demand attachments to standard watt-hour meters are available at even less cost. Thus, it is neither difficult nor expensive to measure demand and add a demand charge to the bill for service.

Opposition of consumers to demand charges can be overcome by explaining the reasons for the charge. REA cooperatives are in a favorable position compared with utility companies to educate their members as to the need for demand charges.

SUMMARY OF ELEMENTS WHICH AFFECT
LARGE POWER RATES AND COST OF FURNISHING SERVICE

<u>Factors which Determine Cost of Furnishing Service</u>	<u>Assumptions Made and Allowances Used</u>
A. Power Cost Wholesale Rate or Generating Cost.	
1. Demand element (in KW or KVA)	
2. Energy element (in KWH)	
3. Adjustments for fuel cost, ratchet clause, dual rate restrictions.	
B. Distribution Losses	Allow 15%
C. New Investment in Service Extension	REA rates are designed to support a new investment of not over \$75 per KW of consumer's demand.
1. Cost of new construction	
2. Salvage value	
3. Deposit by consumer	
	Non-Recoverable investment is amortized over the period of either:
	(a) the term of the power contract, or
	(b) ten years as a maximum period
D. Existing Investment in Distribution Facilities Devoted to Serving the Consumer	REA rates are designed to support not over \$45 per KW of consumer's demand to cover consumer's allocated share of distribution system investment.
E. <u>Annual Expenses Incident to Investment</u>	
Operation, Maintenance and replacement of distribution facilities.	3 percent of investment
Other Operating Expenses	2 percent of investment
Taxes	Usually 1 percent of investment
Interest	2 percent on unamortized investment

E. (Cont'd)

Amortization of investment for sole use of large power consumer less salvage value of such facilities.

Usually 10 or 20 percent of investment annually depending on permanence of service and contract term.

Amortization of general system investment

Based on loan period (generally 35 years)

F. Service at primary distribution line voltage

If consumer furnishes and maintains his transformer substation and pays for transformer losses, allow a 10% discount on power bills.

G. Refund of consumer's deposit.

Usually 10% of power bill. Revenue after refund should be sufficient to cover all expenses.

H. Service Charge per month

1.5% of investment in excess of that allowed for in rate.

